

12 June 1969

Materiel Test Procedure 10-2-085
General Equipment Test Activity

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

LUBRICATING AND SERVICING UNITS

1. OBJECTIVE

This document provides test methods and techniques necessary to determine the technical performance and safety characteristics of lubricating and servicing units, as described in Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), or Technical Characteristics (TC's) and to determine the test item's suitability for service tests.

2. BACKGROUND

A requirement exists for lubricating and servicing units capable of economical and rapid application of lubricants to an extremely broad range of automotive, heavy construction, aircraft, and ground support equipment. It is required that these units operate efficiently under normal and extreme climatic conditions.

There are three basic categories of lubricating and servicing units:

- a. Air-Operated Pump Types
- b. Electrically operated units
- c. Internal Combustion Engine Powered Units

The first two categories with the exception of battery operated units are for use within repair shops. The internal combustion engine powered types may be mounted in several configurations to enhance the amount of mobility required.

All units are capable of pumping one or more types of automotive lubricants into gear or engine cases or servicing standard grease fittings. The larger engine driven types are also provided with compressed air delivery, anti-icing and lubricant heater systems.

3. REQUIRED EQUIPMENT

- a. Platform Scales
- b. Still and Motion Picture Camera and Film.
- c. Measuring Tape.
- d. Pressure Gage, 0-10,000 P.S.I.
- e. Environmental Measuring Apparatus - temperature, barometric pressure, and humidity.
- f. Ohmmeter.
- g. Standard Automotive Hydrometer.
- h. Drop Test Facility.
- i. Environmental Storage Facility (+155°, -65°F, 100% RH).
- j. Equipment and Facilities as required in referenced MTP's.

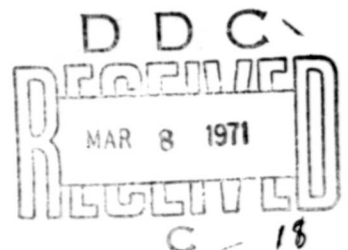
4. REFERENCES

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- A. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- B. USATECOM Regulation 705-4, Equipment Performance Reports.
- C. USATECOM Regulation 700-1, Value Engineering.
- D. USAGETA Document, Human Factors Evaluation Data for General Equipment (HEDGE).
- E. AR 705-15, Operation of Materiel Under Extreme Conditions of Environment, with Change 1.
- F. AR 750-6, Maintenance Support Planning.
- G. HEL-STD-S-1-63B, Maximum Noise Level for Army Materiel Command Equipment.
- H. Materiel Test Directorate, Aberdeen Proving Ground, Automotive Test Facilities, January 1969.
- I. MTP 2-2-500, Vehicle Characteristics.
- J. MTP 2-2-520, Logistics-Over-The-Shore (LOTS).
- K. MTP 2-2-613, Broadband Radio Interference Tests for Vehicles and Electrical Equipment - Noncommunication.
- L. MTP 2-2-800, Center of Gravity.
- M. MTP 7-2-515, Air Transport, Internal.
- N. MTP 10-2-500, Physical Characteristics.
- O. MTP 10-2-501, Operator Training and Familiarization.
- P. MTP 10-2-502, Durability.
- Q. MTP 10-2-503, Surface Transportability (General Supplies and Equipment).
- R. MTP 10-2-505, Human Factors Evaluation.
- S. MTP 10-2-507, Maintenance Evaluation.
- T. MTP 10-2-508, Safety.

5. SCOPE

5.1 SUMMARY

This Materiel Test Procedure defines the following tests to be performed on lubricating and servicing units:

- a. Preparation for Test - A determination of the condition of the test item upon arrival, its physical characteristics and operator training and familiarization procedures.
- b. Preliminary Electrical Test - An evaluation to determine the test item's condition prior to the application of normal operating power.
- c. Performance - An evaluation to determine the following characteristics of the lubricating and servicing units: rate of discharge, leakage resistance, pressure distributions, endurance, accessory performance, and lubricant storage capacities.
- d. Electromagnetic Compatibility - An evaluation to determine the degree to which the test item produces radiated or line conducted interference.
- e. Transportability - An evaluation to determine the ability of the test item to withstand the forces which it will experience during normal handling and transporting.
- f. Environmental Storage - An evaluation to determine the ability of the test item to resist physical damage and to function properly after exposure to the extremes of environment.
- g. Maintainability and Reliability Evaluation - That portion of the

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test which is concerned with the following: verification and appraisal of failures; determination and appraisal of maintenance characteristics and requirements; appraisal of design-for maintainability; appraisal of the maintenance test package; and, calculation of indicators which express the effects of the preceding aspects.

h. Safety - An evaluation to determine the safety characteristics and hazards of the test item.

i. Human Factors Evaluation - An evaluation of the man-item relationship during operation and maintenance of the test item including the noise level generated and design deficiencies which affect operability, maintainability, or transportability.

j. Value Analysis - An evaluation to determine whether or not the test item has any unnecessary features which can be eliminated without affecting the technical performance or safety of the test item.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

Subject the test item to the applicable section of MTP 10-2-500 and the following:

a. Visually inspect the test item package(s) and record the following:

- 1) Evidence of packaging damage or deterioration
- 2) Identification markings, including:
 - a) Name of contractor
 - b) Number and date of contract
 - c) Date of manufacture
 - d) Other markings pertaining to the test item

b. Weigh and measure the individual package(s) of the test item and its accessories and record the following:

- 1) For each shipping package:
 - a) Contents
 - b) Weight
 - c) Length width and height
 - d) Cubage
- 2) For entire test item:
 - a) Weight

b) Cubage

c. Unpack the test item; visually inspect it, and record the following where applicable:

- 1) Type and adequacy of packing material
- 2) Evidence of defects in:
 - a) Manufacturing
 - b) Material
 - c) Workmanship
- 3) Evidence of damage
- 4) Evidence of wear

NOTE: Make use of photographs, diagrams and narration to indicate the condition of the test item.

d. Presence of instruction plates, if applicable, including:

- 1) Identification, name and serial
- 2) Caution instructions
- 3) Service instructions

e. Existence of shortages.

6.1.2 Physical Characteristics

Determine and record the physical characteristics of the lubricating and servicing units as specified in the applicable sections of MTP 10-2-500, and for Vehicular Mounted Units, MTP 2-2-500.

6.1.3 Operator Training and Familiarization

Orient test personnel using the criteria of MTP 10-2-501, recording all pertinent data, and ensure that all members of the test team receive a review of safety precautions listed in the draft technical manuals or developed from previous test experience. The review will, as a minimum, include the following:

- a. Electrical hazards
- b. Fire hazards and extinguishing methods
- c. Mechanical hazards
- d. Operation of pneumatic and hydraulic pressure systems
- e. Material Handling

6.1.4 Preparation

Prepare the lubricating and servicing units for testing as follows:

- a. Perform any set-up of the test item as specified in the draft

technical manual.

- b. Lubricate all components of the test item requiring lubrication following the procedures of the applicable lubrication order.
- c. Check the condition of fire extinguishers, if applicable.
- d. Check the electrolyte level in the battery, if applicable. Add distilled water, if required.
- e. Locate the lubricating and servicing unit where it will receive a clean supply of air. If the test item is of the gasoline engine driven type, do not operate the engine in an enclosed area without proper ventilation. Consult the draft technical manual.

6.2 TEST CONDUCT

Test personnel shall observe all safety precautions associated with the test item.

NOTE: All equipment failures shall be reported in accordance with USATECOM Regulation 705-4.

6.2.1 Preliminary Electrical Test

a. Determine that all electrical cables supplied with the test item are correctly wired by checking continuity with an ohmmeter. Record the following:

- 1) Short circuits
- 2) Open circuits
- 3) Incorrect wiring
- 4) Defects in workmanship

b. For battery powered units, measure and record the specific gravity of the battery fluid using a standard automotive hydrometer.

6.2.2 Performance

6.2.2.1 Leakage

Test all components and accessories of the test item subject to pneumatic or lubricant pressure such as air reservoirs, hose, connectors, lubricant storage tanks, and lubricant applicators for leakage as follows:

a. Determine and mark-off the pneumatic system (consult the draft technical manual):

- 1) Apply a suitable liquid soap solution to all components.
- 2) With the test item in the operational mode and all pneumatic systems at normal operating pressures, visually examine the components for leaks evidenced by air bubbles.

b. Determine and mark-off the pressurized lubricant portion of the

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test item (consult the draft technical manual):

- 1) Apply a suitable liquid soap solution to all components.
- 2) With the test item in the operational mode delivering normal operating pressure to the lubricant applicator (hand-gun), visually examine the system for lubricant leaks.

6.2.2.2 Pressure Tests

Perform the following tests at an atmospheric pressure approximately equal to 29.92 inches Hg and a room temperature approximately equal to 70°F, then repeat the procedures at the maximum and minimum operating temperatures specified for the test item.

6.2.2.2.1 Delivery Pressure - Perform the following for each grease delivery system:

- a. Couple the end of the control valve (hand gun) to a lubricating fitting mounted on a pressure gage with not less than a 0 to 10,000 p.s.i. dial reading range.
- b. Operate the lubricating unit for a continuous pumping period of not less than 5 minutes.
- c. Record the following:
 - 1) Ambient barometric pressure and temperature.
 - 2) Maximum indicated pressure
 - 3) System failures
 - 4) Evidence of leakage

6.2.2.2.2 Static Pressure - Perform the following for each grease delivery system:

- a. Remove the control valve (hand-gun) from the delivery hose.
- b. Couple the end of the hose to a lubricating fitting mounted on a pressure gage with not less than a 0 to 10,000 p.s.i. dial reading range.
- c. Operate the pump at 100 p.s.i.g. air pressure.
- d. Examine the system for leakage.
- e. Record the following:
 - 1) Ambient barometric pressure and temperature
 - 2) Pump air pressure reading
 - 3) Pressure gage reading:
 - a) Initial
 - b) After 5 minute period
 - c) After 10 minute period
 - 4) System failures

6.2.2.3 Rate of Discharge

Determine the test item discharge rate, first at an atmospheric pressure approximately equal to 29.92 inches Hg. and a temperature approximately equal to 70°F and then at the maximum and minimum operating temperatures specified for the test item, as follows:

- a. Clean and weigh a suitable lubricant container.
- b. Attach the control valve to a lubricant fitting (grease systems only) and place the container at the grease/oil outlet.
- c. Operate the lubricating unit for ten, one minute cycles. Weigh the container after each cycle.
- d. Record the following:
 - 1) Ambient pressure and temperature
 - 2) Weight of container prior to test
 - 3) Weight of container after each discharge cycle

6.2.2.4 Lubricant Heater Performance

NOTE: Perform this test on lubricating and servicing units equipped with lubricant heater systems.

- a. Allow the lubricant and servicing unit to undergo a cold soak until the temperature of the contained lubricants is below 32°F.
- b. Perform the rate of discharge test of paragraph 6.2.2.3 and record the required data.
- c. Repeat the procedure of step b using the lubricant heater system as described in the draft technical manual.
- d. Record the temperature of the dispensed lubricant after each cycle.
- e. Record heater malfunctions, if applicable.
- f. Record comments on performance and effectiveness of heater system.

6.2.2.5 Anti-Icing System Evaluation

NOTE: Perform this test on all lubricating and servicing units equipped with alcohol injection systems.

- a. Service the alcohol injector according to the draft technical manual.
- b. Cold-soak the test item and allow it to stabilize at minus 25°F.
- c. Start the engine and operate the compressor for a period of 30 minutes.
- d. Disconnect the air lines at various couplings and open all condensate valves.
- e. Record evidence of ice in the air lines and pumps.

6.2.2.6 Endurance

Perform the applicable endurance test at ambient temperature $70 \pm 5^\circ\text{F}$ as follows:

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6.2.2.6.1 Gasoline Engine Powered Units - Perform the following:

a. Subject the test item to 500 operating hours at rated capacity and pressure.

b. At intervals of 3 hours operating time, reduce engine speed to idle and disengage the clutch. When the compressor has stopped reengage the clutch and resume normal operating speed.

c. Record the following:

1) System Failures:

- a) Elapsed time
- b) Location and description

2) Evidence of:

- a) Breakage
- b) Leakage
- c) Wear

d. At the completion of the test perform the rate of discharge procedure of paragraph 6.2.2.3 at 70°F.

6.2.2.6.2 Electric Powered Units - Perform the following:

a. Subject the test item to 40 operating hours.

b. Couple the hydraulic coupler to a fitting with a back pressure of 1,000 p.s.i.g.

c. Operate the test item for 600 cycles of 3 minutes on and 1 minute off.

d. Record the following:

1) System failures, if any

- a) Elapsed time
- b) Location and description

2) Evidence of:

- a) Breakage
- b) Leakage
- c) Wear

e. At the completion of the test perform the rate of discharge procedure of paragraph 6.2.2.3 at 70°F.

6.2.2.6.3 Battery Powered Units - Perform the following:

a. Subject the lubricating and servicing unit to 400 operating cycles of 1 minute on and 3 minutes off.

b. Couple the hydraulic coupler to a fitting with a back pressure

of 1000 p.s.i.g.

c. Test item operating pressures shall be set at:

- 1) 3000 p.s.i.g. for 200 cycles.
- 2) 6000 p.s.i.g. for 100 cycles.
- 3) 8000 p.s.i.g. for 100 cycles.

d. Record the following:

- 1) System failures, if any:
 - a) Elapsed time
 - b) Location and description
- 2) Evidence of:
 - a) Breakage
 - b) Leakage

e. At the completion of the test perform the rate of discharge procedure of paragraph 6.2.2.3 at 70°F.

6.2.3 Electromagnetic Compatibility

Determine the electromagnetic compatibility of all lubricating and servicing units having electrical or gasoline powered motors as described in the applicable sections of MTP 2-2-613.

6.2.4 Transportability

6.2.4.1 Preparation for Test

Prepare the test item for transport in accordance with instructions in the draft manuals.

6.2.4.2 Surface Transportability Tests

a. Determine the surface transportability of the test item as described in the applicable sections of MTP 10-2-503 with the following modifications:

- 1) The transit drop test shall be performed on non-trailer or skid-mounted units.
- 2) Trailer or skid-mounted units shall be subject to the following road conditions:
 - a) A minimum of ten miles over paved and secondary roads (50 percent each).
 - b) A minimum of 5 miles over washboard roads, sand and loose rock courses equivalent to those at the Aberdeen Proving Ground Munson Test Course (see reference 4H).

- c) A minimum of 5 miles over cross-country courses equivalent to those at the Aberdeen Proving Ground Perryman test Course (see reference 4H).
 - d) A minimum of 1 mile over a Belgium Block Surface (see reference 4H)
- 3) The simulated ship tests, on trailer and skid-mounted units, shall be performed with a roll period of 30 seconds vice 15 seconds.
- b. At the completion of each transportability test perform the following:
- 1) Visually examine the test item and record all damages.
 - 2) Subject the test item to the applicable performance procedures of paragraph 6.2.2 and record any degradation in performance.

6.2.4.3 Air Transportability Tests

NOTE: The conduct of air transportability testing shall be coordinated with the appropriate unit conducting the air transportability tests.

- a. Determine and record the internal air transportability of the test item as described in the applicable sections of MTP 7-2-515.
- b. At the completion of testing repeat the procedures of paragraph 6.2.4.2b.

6.2.4.4 Logistics-Over-The-Shore (LOTS) (Trailer-Mounted Units Only)

Determine the LOTS characteristics of the test item as described in the applicable sections of MTP 2-2-520 and the following:

a. Load the test item and a suitable towing vehicle aboard a landing craft from a ship anchored offshore using normal ships handling equipment. Couple the test item to the towing vehicle, and record the following:

- 1) Sea state.
- 2) Wind direction and speed.
- 3) Equipment used for loading.
- 4) Difficulties encountered loading or coupling and actions taken to overcome difficulties.
- 5) Materials used for securing.
- 6) Damage to test item or towing vehicle.

b. The test item shall be transported to the shoreline, off-loaded and towed through sea and surf up to 20 inches, including vehicle-sinkage depth and wave height, for a minimum of 15 minutes. The test item will then be towed over the sand to a point not less than 2 miles from the shoreline, disassembled, and inspected for damage or water penetration. Determine the optimum tire pressures for both the test item and the towing vehicle and record the following:

- 1) Water depth.
- 2) Difficulties in towing.
- 3) Test item and towing vehicle tire pressures.
- 4) Any deficiencies in operation or damage to the components of the test item.

c. The test item shall be secured for transport, towed to the shoreline and reloaded onto the landing craft by both driving and backing into the craft. Any difficulties encountered in reloading or damage to the test item will be recorded.

6.2.5 Environmental Storage

6.2.5.1 Preparation for Test

Prepare the test item by placing it in a normal shipping or storage container or securing it for storage using the manufacturer's instructions.

6.2.5.2 High Temperature Storage

a. Store the test item for 48 hours in a test chamber producing an air temperature of 155°F at an absolute humidity of 13 grains/ft³ without benefit of solar radiation and with negligible air movement.

b. Remove the test item from storage inspect and record any damage or deterioration to the test item or components.

c. After allowing the test item to return to normal atmospheric conditions, repeat the applicable performance tests of paragraph 6.2.2 at 70°F. Record any degradation in performance due to the storage evaluation.

6.2.5.3 Low Temperature Storage

a. Store the test item for 48 hours in a test chamber producing in air temperature of -65°F without benefit of solar radiation and with negligible air movement.

b. Repeat the procedures of steps b and c of paragraph 6.2.5.2.

6.2.5.4 Warm-Wet Storage

a. Store the test item for 48 hours in a test chamber producing an air temperature of 85°F at a relative humidity of 100%.

b. Repeat the procedures of steps b and c of paragraph 6.2.5.2

6.2.6 Maintainability and Reliability Evaluation

Evaluate the maintenance-related factors of the test item as described in MTP 10-2-507 with emphasis on the following:

a. Organizational (O), Direct Support (F), and General Support (H) Maintenance requirements.

b. Operator through General Support Maintenance Literature.

c. Repair parts.

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- d. Tools.
- e. Test and handling equipment.
- f. Calibration and maintenance facilities.
- g. Personnel skill requirements.
- h. Maintainability.
- i. Reliability.
- j. Availability.

6.2.7 Safety

Determine the safety characteristics of the test item as described in the applicable sections of MTP 10-2-508 and as follows:

a. Throughout the test period, test personnel shall observe and record any conditions that might be hazardous, the cause of the hazard, and steps taken to alleviate the hazard.

b. On electrically powered units, check for ground voltages in the machinery or frame of the test item.

6.2.8 Human Factors Evaluation

Determine the man-item considerations as described in the applicable sections of MTP 10-2-505 and the following:

a. Develop task item checklists which detail the human factors design criteria for each major piece of equipment and the test item as a whole. These checklists will provide for test supervisory personnel comments regarding the degree to which human factors considerations have been included in the design of the equipment. Detailed criteria for each task may be developed from Human Factors Evaluation Data for General Equipment (HEDGE) for Class IIIA equipment and will include evaluation of the following:

1) Operability

- a) Labels
- b) Securing/lifting devices
- c) Carrying case
- d) Tool alignment guides/controls
- e) Fittings and adapters
- f) Operating components
- g) Expendable reservoir elements

2) Maintainability

- a) Operating components
- b) Fasteners and connectors
- c) Displays
- d) Test elements
- e) Labels
- f) Tools and special equipment
- g) Job aids and manuals

3) Transportability:

- a) Packaging
- b) Expendable fillers/indicators
- c) External operating components
- d) Handling and tie down devices
- e) Labels

b. Supplement checklist data with test personnel comments on test item comfort, accessibility, ease of assembling and dismantling, transportability, safety and dependability, as applicable.

c. Record any difficulties arising from man-item relationship and actions taken, or suggestions given to overcome them.

d. Determine and record acceptability of Noise Level utilizing procedures and criteria in accordance with applicable sections of HEL-STD S-1-63B.

6.2.9 Value Analysis

a. Throughout all testing, test personnel shall examine the design and construction of the test item from a value standpoint in an effort to effect cost reduction of the test item. In particular, the following possibilities should be considered:

- 1) Deletion of ineffective or unnecessary features or components.
- 2) Substitution of less expensive but comparable components or materials.
- 3) Suggested design changes in order to reduce the cost of manufacturing or operation.

b. The proposals resulting from the evaluation should not result in loss of performance, reliability, durability, or safety of the test item.

c. Record the following:

- 1) Component or feature involved.
- 2) Suggested change.
- 3) Reasons for suggestion.
- 4) Expected effect on performance, reliability, durability, or safety.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Initial Inspection

Record the following:

- a. Evidence of packaging damage or deterioration
- b. Identification markings:

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- 1) Name of contractor
 - 2) Number and date of contract
 - 3) Date of manufacture
 - 4) Other pertinent markings
- c. For each shipping package:
- 1) Contents
 - 2) Weight, in pounds
 - 3) Overall dimensions, in feet and inches of:
 - a) Length
 - b) Width
 - c) Height
 - 4) Cubage, in ft³
- d. For the entire test item:
- 1) Weight, in pounds
 - 2) Cubage, in ft³
- e. Defects in:
- 1) Material
 - 2) Construction
 - 3) Workmanship
- f. Evidence of damage
- g. Evidence of wear
- h. Presence of:
- 1) Identification plate
 - 2) Caution instruction plate
 - 3) Service instruction plate
- i. Shortages

6.3.1.2 Physical Characteristics

Record the data collected as described in applicable sections of MTP 10-2-500, and MTP 2-2-500, when applicable.

6.3.1.3 Operator Training and Familiarization

Record the following:

- a. Data collected as described in applicable sections of MTP 10-2-501.

6.3.2 Test Conduct

6.3.2.1 Preliminary Electrical Tests

Record the following:

- a. Short circuits in cables
- b. Open circuits in cables
- c. Incorrect wiring
- d. Defects in workmanship
- e. Specific gravity of battery fluid, if applicable

6.3.2.2 Performance

6.3.2.2.1 Leakage -

Record the following:

- a. Item being tested
- b. Nature and location of any leaks detected

6.3.2.2.2 Pressure Tests -

Delivery Pressure

Record the following:

- a. For each grease delivery system delivery pressure test:
 - 1) Ambient barometric pressure in inches Hg and temperature in °F.
 - 2) Maximum indicated pressure (psig).
 - 3) System failures.
 - 4) Evidence of leakage.
- b. For each grease delivery system static pressure test:
 - 1) Ambient barometric pressure in inches Hg and temperature in °F.
 - 2) Pump air pressure reading (psig).
 - 3) Pressure gage readings:
 - a) Initial
 - b) After 5 minutes period
 - c) After 10 minute period
 - 4) System failures.

6.3.2.2.3 Rate of Discharge -

Record the following:

- a. Ambient barometric pressure in inches Hg and temperature in °F

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- b. Weight of container prior to test
- c. Weight of container after each discharge cycle

6.3.2.2.4 Lubricant Heater Performance -

- a. Data collected as described in paragraph 6.2.2.3
- b. Temperature of dispensed lubricant after each cycle in °F
- c. Comments regarding effectiveness of heater system.
- d. Malfunctions of heater system

6.3.2.2.5 Anti-Icing System Evaluation

Record evidence of ice in the air lines and pumps

6.3.2.2.6 Endurance Test -

Record the following:

- a. Unit being tested (gasoline engine powered, electric powered, etc.).
- b. System failures:
 - 1) Elapsed time
 - 2) Location and description
- c. Evidence of:
 - 1) Breakage
 - 2) Leakage
 - 3) Wear
- d. Data collected as described in paragraph 6.2.2.3.

6.3.2.3 Electromagnetic Compatibility

Record data collected as described in applicable sections of MTP 2-2-613.

6.3.2.4 Transportability

6.3.2.4.1 Surface Transportability Tests -

Record the following for each test performed:

- a. Test performed (ship test, rail test, etc.).
- b. Data collected as described in MTP 10-2-503.
- c. Evidence of damage.
- d. Data collected as described in the applicable section of paragraph 6.2.2.

6.3.2.4.2 Air Transportability -

Record the following:

- a. Data collected as described in the applicable sections of MTP 7-2-515.
- b. Evidence of damage.
- c. Data collected as described in the applicable sections of paragraph 6.2.2.

6.3.2.4.3 LOTS (Trailer-Mounted Units Only) -

Record the following:

- a. Sea state (1, 5 etc.) and duration, in seconds.
- b. Wind direction and speed, in knots.
- c. Equipment used for loading.
- d. Difficulties encountered loading or coupling and action taken to overcome difficulties.
- e. Material used for securing.
- f. Damage to test item or towing vehicle.
- g. Water depth, in inches.
- h. Difficulties in towing.
- i. Test item and towing vehicle tire pressures, psi.
- j. Any operational deficiencies or damage to the components of the test item.
- k. Difficulties encountered during reloading and action required to overcome difficulties.
- l. Damages to test item during reloading.

6.3.8 Environmental Storage

Record the following for each storage condition:

- a. Temperature, degrees F.
- b. Relative humidity, percent.
- c. Time of storage, hours.
- d. Time to return to normal operating conditions, hours.
- e. Data collected as described in the applicable sections of paragraph 6.2.2.
- f. Degradation in performance, and/or damage as a result of storage.

6.3.9 Maintainability and Reliability Evaluation

Record data collected as described in the applicable section of MTP 10-2-507.

6.3.10 Safety

Record the following:

- a. Data collected as described in applicable sections of MTP 10-2-508.
- b. Any condition that may present a safety hazard, cause of the hazard, and steps taken to alleviate the hazard.

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- c. Presence of ground voltages in machines or frame of test item.

6.3.11 Human Factors Evaluation

Record the following:

- a. Data collected as described in the applicable sections of MTP 10-2-505.
- b. Test personnel responses to checklists.
- c. Additional comments on comfort, accessibility, assembling, dismantling, transportability, safety, and dependability as applicable.
- d. Difficulties arising from man-item relationships and actions taken or suggestions to overcome them.
- e. Noise level data collected as described in HEL-STD S-1-63B.

6.3.12 Value Analysis

Record the following:

- a. Component or fixture involved
- b. Suggested change
- c. Reasons for suggestion
- d. Expected effect on performance, reliability, durability, or safety

6.4 DATA REDUCTION AND PRESENTATION

Data obtained during the conduct of the test will be summarized using photographs, graphs and tables, as appropriate. All photographs will be properly identified and annotated.

Data for each performance characteristic will be compared with technical performance characteristics as specified in QMR's, SDR's, TC's, or other developmental criteria. Test data obtained from different types of lubricating and servicing units undergoing the same test will be compared. Where performance data is repeated after exposure to a stress condition, significant discrepancies in performance caused by the stress condition will be clearly shown with appropriate comments regarding the reasons for the discrepancy.

In addition to graphs, tables, and photographs, presentation shall include narrative reports covering all phases of the test. The presentation shall conclude with a summary of the test item's suitability for service testing.

A preliminary Report shall be submitted in accordance with USATECOM Regulation 385-6 based on the data collected related to safety.

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